WHAT IS CLAIMED IS:

1. A solid immersion lens attached to an observed object and to be used for an observation of the observed object, wherein

an attaching surface to the observed object is formed in a toroidal shape.

2. The solid immersion lens as set forth in Claim 1, wherein

when a to-be-attached surface of the observed object is set to an X-Y plane, a ratio of a radius of curvature in the X-direction of the toroidal shape to a radius of curvature in the Y-direction greater than the radius of curvature in the X-direction is provided as $1:3 \sim 1:\infty$.

3. The solid immersion lens as set forth in Claim 1, wherein

an attaching surface to the observed object is formed in a cylindrical shape.

4. The solid immersion lens as set forth in Claim 1, wherein

an attaching surface to the observed object receives a hydrophilic treatment.

5. The solid immersion lens as set forth in Claim 1, wherein

the solid immersion lens is formed of a material with a refractive index n_L while having a spherical

optical surface with a radius of curvature R_L, a distance along an optical axis from the vertex to a virtual observing surface when a refractive index of the observed object is equalized to the refractive index n_L is provided, by a coefficient k (0<k<1) set so that geometrical aberration characteristics satisfy predetermined conditions, as $L = R_L + k \times (R_L/n_L)$, and

when the refractive index of the observed object is provided as n_s and a thickness of the observed object to an actual observing surface is provided as t_s, a thickness along the optical axis satisfies $d_L = L - t_s \times (n_L/n_s)$.

6. The solid immersion lens as set forth in Claim 5, wherein

the thickness of the observed object to the actual observing surface is $t_s=0$, and the thickness along the optical axis is $d_L = L = R_L + k \times (R_L/n_L)$.

7. The solid immersion lens as set forth in Claim 5, wherein

the coefficient k is a value within a range of $0.5 < k < 0.7$.

8. The solid immersion lens as set forth in Claim 5, wherein

the coefficient k is a value within a range of $0 < k \leq 0.5$.

9. A microscope for observing an observed object,

comprising:

an optical system for leading an image of the observed object, including an objective lens into which light from the observed object is made incident; and

the solid immersion lens as set forth in Claim 1.

10. A microscope as set forth in Claim 9, further comprising:

an optical coupling material feeding unit for feeding an optical coupling material.